President, First Lady Celebrate Commissioning of USS Delaware

President Joe Biden and First Lady Jill Biden, the ship sponsor, celebrated the commissioning of the Virginia-class fast attack submarine USS Delaware (SSN 791) Saturday, April 2. *U.S. NAVY*

WILMINGTON, Delaware – President Joe Biden and First Lady Jill Biden, the ship sponsor, celebrated the commissioning of the Virginia-class fast attack submarine USS Delaware (SSN 791) Saturday, April 2, in a ceremony in Wilmington, Delaware.

Biden previously represented the state of Delaware for 36 years in the U.S. Senate.

Due to COVID restrictions in place at the time, there was no traditional commissioning ceremony held when USS Delaware was

commissioned administratively on April 4, 2020. On that day, the submarine was underway and became the first U.S. Navy ship commissioned while submerged.

Saturday's ceremony followed the script of a traditional commissioning and was held in commemoration of the milestone.

"This latest Navy ship to carry the Delaware name is part of a long tradition of serving our nation proudly and strengthening our nation's security," Biden said. "Not just us, but our allies and partners around the world as well."

As the ship sponsor, Jill Biden performed the traditional honor of calling for the crew to man the ship and "bring her to life," a ceremonial procession following the commemorative setting of the first watch.

"This vessel will always uphold the First State's motto of 'Liberty and Independence,'" she said. "It's difficult to put into words what it means to be a part of the USS Delaware family. It's an incredible honor that I take seriously. I've seen the heart of this crew and it makes me proud and humbled to be your shipmate for life."

USS Delaware is the 18th Virginia-class submarine built, as well as the eighth and final Block III Virginia-class sub. The Block III submarines are notable for replacing 12 vertical launch tubes for Tomahawk Land Attack Missiles with two larger, 87-inch diameter launch tubes, capable of carrying larger payloads, among other advancements.

"The men who serve – and will serve – aboard the USS Delaware will bear our state's name for decades to come as they defend our nation," said U.S. Sen. Tom Carper of Delaware, the event's keynote speaker. "Through their sacrifice and service, may we grow even closer to that more perfect union."

USS Delaware is homeported at Submarine Base New London in Groton, Connecticut, where it operates under Submarine Squadron 12 and its Commodore, Capt. Matthew Boland.

The submarine is the seventh U.S. Navy ship to be named for the First State, but first in more than a century. The first ship to be named Delaware was a 24-gun frigate launched in July of 1776, the month the Continental Congress adopted the Declaration of Independence.

Lockheed Martin Marks Delivery of 500th C-130J Super Hercules

An HC-130J Super Hercules long range surveillance aircraft sits on a runway in Waco, Texas, following its arrival May 11, 2017, to begin installation of the Minotaur Mission System Suite. *U.S. Coast Guard*

ARLINGTON, Va. — The 500th C-130J Super Hercules aircraft built by Lockheed Martin (Booth 1001) has been delivered to its customer, the company announced March 15.

The aircraft, Lockheed Martin C-130 construction number 5934, is a C-130J-30 version that was delivered to the 130th Airlift Wing, a unit of the West Virginia Air National Guard based at McLaughlin Air National Guard Base in Charleston, West Virginia. The wing is replacing its older C-130 Hercules aircraft with new C-130J-30s.

The C-130J Super Hercules represents a significant advancement in performance, technology and airlift capability over the older C-130 Hercules family of aircraft. The C-130J is equipped with the more powerful Rolls-Royce AE 2100D3

turboprop engines, six-bladed GE-Dowty R391 composite propellers, modern avionics and mission systems. The Super Hercules features dual head-up displays, an integrated defensive suite, automated maintenance fault reporting, and a rear ramp door capable of opening at airspeeds of up to 250 knots. It has greater speed, range lift capacity, climb rate, cruise altitude and short-field performance than the legacy C-130.

The C-130J Super Hercules is the current production model of the legendary C-130 Hercules aircraft. The C-130J first flew in 1996 and entered service in 1999. It is now the airlift aircraft of choice of 26 operators in 22 nations.

The U.S. military services operate the largest C-130J Super Hercules fleet in the world. The U.S. Air Force and Air National Guard collectively operate C-130J, C-130J-30, AC-130J Ghostrider, EC-130J Commando Solo, HC-130J Combat King II, MC-130J Commando II and WC-130J Weatherbird variants. The Marine Corps operates the KC-130J tanker version and a C-130J as part of the Blue Angels Flight Demonstration Team. The Coast Guard operates a version of the HC-130J which is different than the version used by the Air Force for search, rescue and logistics. The U.S. Navy is planning to test a version of the C-130J-30 for the Take Charge and Move Out (TACAMO) strategic communications mission.

These are some of the 17 different mission configurations of the C-130J used worldwide for transport (military and commercial), humanitarian aid delivery, aerial firefighting, natural disaster relief support, medevac, search and rescue, special operations, fire support, weather reconnaissance, atmospheric research and aerial refueling.

The C-130J-30 is a version of the Super Hercules, which has an extended fuselage (15 feet, or 4.6 meters) when compared to the basic C-130J. As such, it can carry 30% more passengers and cargo than the basic C-130J and 50% more container

delivery system bundles.

The rugged C-130 family of aircraft has been in serial production longer than any other military aircraft in the U.S. inventory. The first C-130A made its first flight in 1954 and entered service in 1956. Since the first C-130 rolled of the Lockheed Martin production line, more than 2,100 were built before production switched to the C-130J. It is flown out of more than 70 nations and has been certified to support upwards of 100 different mission capabilities in its lifetime.

“No aircraft in history, production or operation matches the C-130 Hercules in terms of its versatility. The C-130J both extends and expands this reputation thanks to increased speed, integration and strength,” said Rob Toth, director of Business Development for Lockheed Martin’s Air Mobility and Maritime Missions line of business.

As a retired U.S. Air Force Special Operations MC-130H navigator, Toth has experience flying and commanding operations with both legacy and C-130J aircraft.

“The legacy Hercs were great aircraft. The C-130J offers a more enhanced flying experience, especially with the advanced situational awareness and added power,” he said. “You the value of those attributes across all mission scenarios, especially with the maritime patrol, search and rescue, special operations and aerial refueling requirements supported by the U.S. Marine Corps and Coast Guard.”

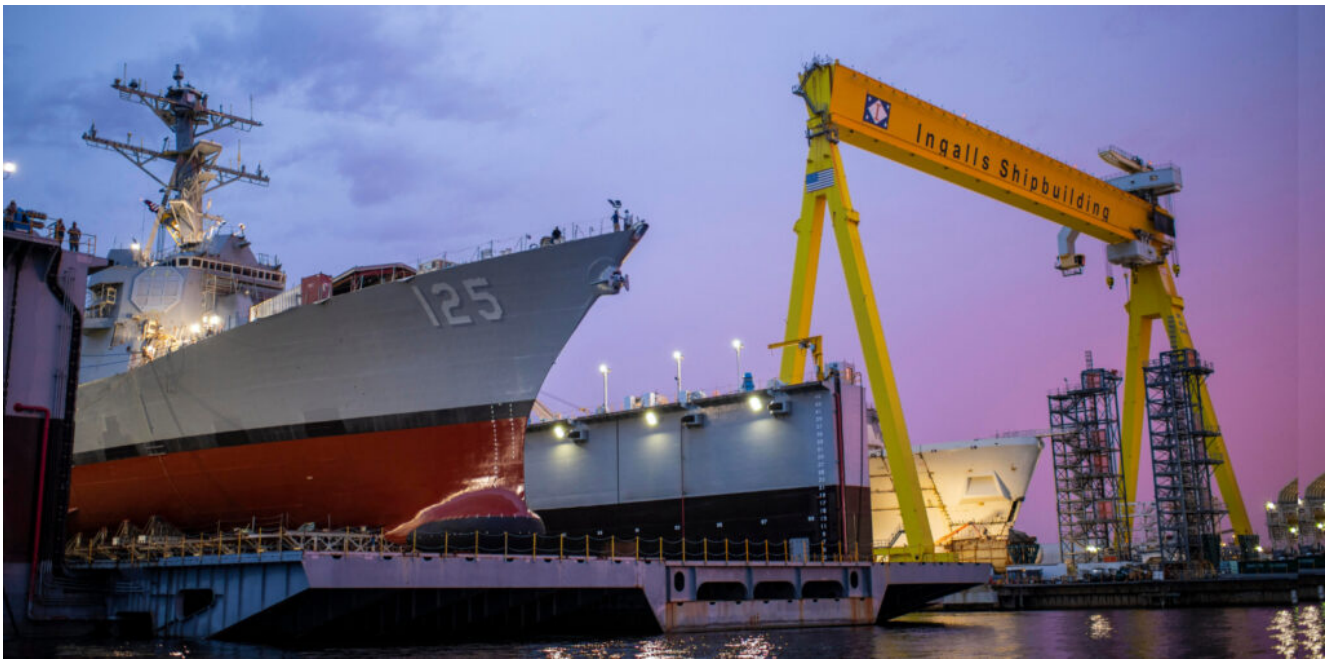
To date, the Navy is the only U.S. government operator to not have a J in its fleet. Currently the Navy flies C-130s for transport and for 20 years (1963-1993) on the TACAMO missions.

Lockheed Martin is honored to have the Super Hercules selected for TACAMO testing – possibly bringing it back to where it all began, Toth said.

“We are working closely with NAVAIR to support an aggressive

acquisition strategy that prioritizes both speed of acquisition and affordability to accelerate recapitalization of one of our nation's most important capabilities – survivable, reliable, and endurable communications between the president and the nation's nuclear forces," Toth adds. "We are proud to be at the heart of this effort and confident that the Super Hercules will deliver the critical capability our nation needs."

With SPY-6, Navy Has Radar to Match the Range of its Missiles



The SPY-6(V)1 is being installed on Flight III Arleigh Burke-class DDGs. This air-and-missile-defense radar has been installed on the future USS Jack H. Lucas (DDG 125), shown here, scheduled to join the fleet in 2024. *HII*

ARLINGTON, Va. – The SPY-6 air and missile defense radar, the first of which has been installed on a guided-missile

destroyer, will give the Navy a sensor worthy of its long-range Standard SM-3 Block IIA surface missiles, Raytheon officials said.

Briefing reporters April 1, Ken Spurlock, Raytheon's Strategic Missile Defense Requirements & Capabilities director, said the SM-3 missile "out-shot" the capabilities of earlier radars – presumably the SPY-1 on earlier DDGs. With the SPY-6, the SM-3 "can engage at the maximum range possible" for the missile.

Spurlock said the SPY-6 allows a ship to provide air and missile defense simultaneously, provide regional defense organically, offer greater clarity of the battlespace, give more defense in depth, reduce the risk of fratricide and reduce the number of missiles needed to defeat a target.

Also briefing was Michael Nulk, Raytheon's associate director, Requirements and Capabilities – Naval Power, said the SPY-6 will give commanders the discrimination capability to make better decisions and to "change their shot doctrine."

"There is no other radar with the surface maritime capabilities of SPY-6," Wes Kremer, president of Raytheon Missiles & Defense, said in a March 31 release. "SPY-6 is the most advanced naval radar in existence, and it will provide our military a giant leap forward in capability for decades to come."

Raytheon Missiles & Defense was awarded a $651 million Naval Sea Systems Command contract, with options totaling $2.5 billion, for "hardware, production and sustainment for full-rate production" of the SPY-6 family of radars. The contract provides for five years of production for radars for up to 31 U.S. Navy ships of seven types.

Scott Spence, naval radars executive director at Raytheon Missiles & Defense, also briefing reporters, said the company had 46 SPY-6 shipsets under contract, with six of those in work at the Raytheon plant. He said the enlarged footprint of

the SPY-6 production will help reduce sustainment costs.

Spence noted the last transmitter that Raytheon builds for the SPY-1 radar will be delivered in April, concluding 41 years of production for the SPY-1.

The SPY-6 family includes the SPY-6(V)1, being installed on Flight III Arleigh Burke-class DDGs. The (V)1 has four flat antenna faces each with 37 radar module assemblies. This air-and-missile-defense radar has been installed on the future USS Jack H. Lucas (DDG 125), scheduled to join the fleet in 2024. The second shipset has been delivered for installation on the future USS Ted Stevens (DDG 128).

The SPY-6(V)2 Enterprise Air Surveillance Radar (EASR) has a rotating face with nine RMAs. The (V)2 will equip the America-class and Wasp-class amphibious assault ships, San Antonio-class amphibious transport dock ships, and Nimitz-class aircraft carriers.

The SPY-6(V)3 EASR has three fixed faces each with nine RMAs. The (V)3 will be installed on Ford-class aircraft carriers and Constellation-class guided-missile frigates.

The SPY-6(V)4 EASR will have four fixed faces each with 24 RMAs. The (V)4 will be back-fitted on some Flight IIA Arleigh Burke-class DDGs.

Builders, Suppliers of Navy Ships Facing Inflation Costs

for Materials

USS Gerald R. Ford (CVN 78) transits the Atlantic Ocean, March 30, 2022. *U.S. NAVY / Mass Communication Specialist 3rd Class Jackson Adkins*

ARLINGTON, Va. — The price inflation hitting American consumers also is hitting the shipyards that builds ships for the U.S. Navy, which are facing increased costs for the materials used to build the ships and their components, said two executives who chair shipbuilder and supplier industrial base coalitions.

Suppliers who were not given advance funding especially are vulnerable to price inflation, which could have long-term effects in driving up the cost of the ships the Navy plans to procure. In addition, the shipbuilders are facing daunting labor shortages in the current tight labor market.

David Forster, a retired Navy captain, Global Strategy Executive of Naval Services, Rolls-Royce North America Inc.,

and chairman of the Amphibious Warfare Industrial Base Coalition, and Rick Giannini, chairman of the Aircraft Carrier Industrial Base Coalition and CEO of Milwaukee Valve, described the industrial base challenges of the fiscal 23 budget and Future Years Defense Plan in an April 1 interview with *Seapower*.

Giannini said inflation is the top concern of the aircraft carrier industrial base, especially to those suppliers who did not receive advance funding during the COVID-19 pandemic. He said the block buy of CVNs 80 and 81 saved the taxpayers money because it allowed suppliers to order advance materials, which are now in hand and unaffected by the inflation now hitting the industry.

Giannini's company, Milwaukee Valve, uses a large amount of nickel and copper in its aircraft carrier components, which it ordered as soon as possible for two CVNs and was able to lock in the low costs before the current inflation. He said the prices of nickel have jumped and that suppliers that did not or could not order earlier were now facing the effects of inflation.

The ACIBC chairman said the CVN block buy is going well from his perspective and the ACIBC is working to show Congress the benefits of a two-CVN buy, including the advance procurement of materials that helps the suppliers to have the materials on hand when the builder needs them, making for a smooth build rate.

Forster said the Navy's efforts to award contracts early during the first two years of the COVID pandemic "saved a lot of jobs" and gave credit to James "Hondo" Geurts, then assistant secretary of the Navy for research, development and acquisition, for his successful efforts to advance funding to shipbuilders and in turn to their suppliers.

Forster said the three to 3.5 year build cycle for amphibious

assault ships was in place and good for the stability of the industrial base, but the Navy's 2023 budget plan to end procurement of the Flight II San Antonio-class amphibious transport dock ships after a "handshake deal" for a block buy was disappointing and illustrated the ambiguity of the plans, especially since Marine Corps Commandant Gen. David Berger supported a requirement of 31 large- and medium-size amphibious warfare ships. In concert with the 2023 budget calling for the decommissioning of four dock landing ships, the Navy's budget is at odds with its plans to a build a force structure of 31 amphibious warfare ships.

Forster also noted the procurement of the light amphibious warship had slid until 2025, a further challenge to stability for the workforce.

He also advocates the Navy procure a replacement for the amphibious assault ship USS Bonhomme Richard, which was scrapped after a devastating fire in July 2020, having been modified for operation of the F-35B strike fighter.

Giannini said the second major concern of the shipbuilders and its supplier industrial base was the workforce, which is stressed by the difficulty of hiring skilled labor. He cited the increasing age of the workforce and the retirements earlier than planned as a consequence of the COVID-19 pandemic.

The Navy's shipbuilding and ship retirement plans for 2023 and the Future Years Defense Plan and are likely to face intense scrutiny from the armed services committees in Congress, who have pushed back against retirement plans for several ships in the recent past and have been critical of the Navy's "divest to invest" strategy.

DoD Releases Fiscal Year 2021 Freedom of Navigation Report

Arleigh Burke-class guided-missile destroyer USS Barry (DDG 52) transits the Taiwan Strait during a routine transit in 2021. *U.S. NAVY / Mass Communication Specialist 3rd Class Justin Stack*

ARLINGTON, Va. — The Department of Defense released on April 1 its annual Freedom of Navigation Report for fiscal year 2021. During the period from Oct. 1, 2020, through Sept. 30, 2021, U.S. forces operationally challenged 37 different excessive maritime claims made by 26 different claimants throughout the world.

Excessive maritime claims are inconsistent with international law as reflected in the Law of the Sea Convention. They include a variety of restrictions on the exercise of navigation and overflight rights and other freedoms. Unlawful maritime claims — or incoherent theories of maritime

entitlements – pose a threat to the legal foundation of the rules-based international order. If left unchallenged, excessive maritime claims could limit the rights and freedoms enjoyed by every nation.

Upholding freedom of navigation as a principle supports unimpeded lawful commerce and the global mobility of U.S. forces. DoD's freedom of navigation operations demonstrate the United States will fly, sail, and operate wherever international law allows.

DoD's regular and routine operational challenges complement diplomatic engagements by the U.S. State Department and supports the longstanding U.S. national interest in freedom of the seas worldwide.

Each year, DoD releases an unclassified summarized FON Report identifying the broad range of excessive maritime claims that are challenged by U.S. forces. It also includes general geographic information to describe the location of FON assertions while still maintaining operational security of U.S. military forces.

Click to see previous DoD FON Reports.

CNO, Indonesian Navy Chief Meet; Discuss Maritime Security

Chief of Naval Operations Adm. Mike Gilday, shown speaking to the U.S. Naval Academy's Silent Drill Team at the christening ceremony for the future Jack H. Lucas (DDG 125) in Pascagoula, Mississippi, March 26. *U.S. NAVY / Cmdr. Courtney Hillson*

WASHINGTON – Chief of Naval Operations Adm. Mike Gilday met with Chief of the Indonesian Navy Adm. Yudo Margono, at the Pentagon, March 30, the CNO's public affairs office said in a release.

This was their first meeting, during which the two leaders discussed the importance of maritime security and exchanged views on regional and global security issues.

"Working alongside our Allies and partners has never been so important. Today's maritime challenges require interoperability and presence," said Gilday. "Together we will continue to keep the maritime commons open and free as we promote the security, stability, and prosperity of the Indo-Pacific."

The two leaders exchanged views about security issues in the

Indo-Pacific, underscoring the importance of the U.S.-Indonesian bilateral relationship.

“The purpose of this visit is to enhance relationships and partnerships between the two navies that have been well established so far,” said Margono.

Gilday emphasized a commitment to continuing dialogue and building upon our strong bilateral defense relationship.

“For more than 70 years, Indonesia has been a valued partner,” said Gilday. “There is a strong strategic partnership between Indonesia and the U.S. and I am grateful for our long history of collaboration, cooperation, and training,” said Gilday.

Gilday and Margono also reviewed progress made in recent years in military-to-military cooperation to increase exercises and training, as well as regular defense policy dialogues.

U.S. and Indonesia operate together around the globe regularly. Indonesia has been part of the CARAT exercise series since it began in 1995. After 27 years of annual training events between the armed forces, CARAT Indonesia remains a model for cooperation that has evolved in complexity and enables both navies to refine operations and tactics in response to both traditional and non-traditional maritime security challenges.

The U.S.-Indonesian relationship is strengthened through training. For the first time, Indonesia has two midshipman attending the U.S. Naval Academy.

SECNAV Names Future Replenishment Oiler Ship Ruth Bader Ginsburg

USNS John Lewis (T-AO 205), the Navy's lead ship of its new class of fleet replenishment oilers. A future ship in the class will be named USNS Ruth Bader Ginsburg. *GENERAL DYNAMICS NATIONAL STEEL AND SHIPBUILDING. CO.*

WASHINGTON – Secretary of the Navy Carlos Del Toro announced March 31 that a future John Lewis-class replenishment oiler (T-AO) ship will be named USNS Ruth Bader Ginsburg to honor the former Supreme Court Justice and women's rights activist.

The future USNS Ruth Bader Ginsburg (T-AO 212) will be the first U.S. Navy ship to bear her name.

"As we close out women's history month, it is my absolute honor to name the next T-AO after the Honorable Ruth Bader Ginsburg. She is a historic figure who vigorously advocated

for women’s rights and gender equality,” said Del Toro. “As Secretary of the Navy, it is my aim to ensure equality and eliminate gender discrimination across the Department of the Navy. She is instrumental to why we now have women of all backgrounds, experiences and talents serving within our ranks, side by side with their male Sailor and Marine counterparts.”

The name selection for the John Lewis-class replenishment oiler follows the naming convention of honoring people who have fought for civil and human rights. Born in 1933, Ruth Bader Ginsburg was a pioneering advocate for women’s rights turned Supreme Court Justice. Ginsburg made history as the second woman to serve on the U.S. Supreme Court when she was nominated by President Bill Clinton and confirmed in 1993. Of her 27-year tenure on the Supreme Court, she is most noted for her work toward issuing the majority opinion for United States v. Virginia, a landmark 1996 case that struck down Virginia Military Institute’s male-only admissions policy.

The future T-AO 212 is the eighth of the T-AO ships awarded to the Navy, with the first delivered in 2021. The class and lead ship T-AO 205 is named in honor of Rep. John Lewis (D-Ga).

Del Toro also named Justice Ginsburg’s daughter, Jane Ginsburg, as the ship’s sponsor.

T-AO ships are fleet oilers designed to transfer fuel to the Navy’s operating carrier strike groups. The oilers have the ability to carry a load of 162,000 barrels of oil, maintain significant dry cargo capacity, aviation capability and a speed of 20 knots. General Dynamics National Steel and Shipbuilding Company designed the vessels with double hulls that protect against oil spills as well as strengthened cargo and ballast tanks. The T-AO measures 742-feet in length with a full load displacement of 49,850 tons.

HELIOS Laser Weapon System Delivered for Installation on USS Preble

An artist’s rendering of Lockheed Martin’s HELIOS system. *LOCKHEED MARTIN*

ARLINGTON, Va. — The Navy’s newest laser weapon system has completed range testing at Wallops Island, Virginia, and is being installed on the U.S. Navy’s Flight IIA Arleigh Burke-class guided-missile destroyer USS Preble in San Diego.

The first High-Energy Laser with Integrated Optical Dazzler and Surveillance, or HELIOS, built By Lockheed Mission Systems and Sensors, has started phased delivery to the Preble at the BAE Systems yard in San Diego. It will be the first laser weapon system to be integrated with a ship’s Aegis Combat

System and power and cooling systems, said Jon Rambeau, Lockheed Martin's vice president and general manager for Integration for Systems and Sensors, during a March 30 interview with *Seapower*.

The 60-kilowatt HELIOS is scalable, Rambeau said, up to 120 kilowatts with minor modifications such as the addition of more fiber-optic laser modules. It has replaced the Preble's forward Mk15 Close-In Weapon System.

"We believe the 60- to 120-kilowatt-range systems can be effective against an ASCM [anti-ship cruise missile]," Rambeau said. "We've done some modeling that demonstrates that, we believe, and also looking soon to be able to back that up with some real-world test data. Watch for some news that should be coming soon as we continue the test program."

The 60-kilowatt HELIOS also can be used for surveillance and as a counter-unmanned aerial system dazzler. The HELIOS also is adaptable to the Ship Self-Defense System on aircraft carriers and newer amphibious warships.

"After better than a decade of that question being out there, 'When are these systems going to demonstrate that they're tactically relevant,' we're really right at the threshold of that to the point where the conversation is not going to be anymore, 'Are those going to work?' and 'Are they going to be useful on the battlefield?'" Rambeau said. "Rather, the question is going to turn more to funding priorities, price points, the capacity of our industry primes, and the supply chain that could build these things in full quantities and at scale and then, ultimately, conversations around doctrine and how they would actually be employed in combat.

"It's really exciting time in lasers and it has been a long time in coming," he said.

The HELIOS contract was awarded to Lockheed Martin in January 2018. The company is also developing a layered laser weapon

system for the U.S. Army.

Coast Guard Crew Offloads $223 Million Worth of Drugs in San Diego

The Coast Guard Cutter Kimball (WMSL-756) crew offloads about 11,300 pounds of cocaine and roughly 4,000 pounds of marijuana worth more than $223 million on March 31 in San Diego. *U.S. COAST GUARD / Petty Officer 3rd Class Alex Gray*

SAN DIEGO – The Coast Guard Cutter Kimball (WMSL 756) crew offloaded more than 11,300 pounds of cocaine and more than 4,000 pounds of marijuana worth more than $223 million March 31 in San Diego, the Coast Guard 11th District said in a release.

The drugs were interdicted in international waters of the Eastern Pacific Ocean off the coasts of Central and South America, including contraband seized and recovered during eight interdictions of suspected drug smuggling vessels between late February and early March.

“At-sea interdictions of pure cocaine are the most effective way to limit cartel’s destabilizing effects throughout the Western Hemisphere,” said Vice Adm. Michael McAllister, Coast Guard Pacific Area commander. “Coast Guard national security cutters like Kimball are the service’s most capable asset to strengthen maritime governance, but when team partners from the Royal Canadian Navy and U.S. Navy Littoral combat ships they leverage our network of international and interagency partners to reduce the availability of illicit drugs in the Western Hemisphere and facilitate U.S. Attorney’s efforts to close the cycle of justice.”

The drugs were interdicted by the following ships (the total amount listed below is 11,301 pounds of cocaine and 4,076 pounds of marijuana):

- Kimball’s crew was responsible for one interdiction seizing approximately 2,295 pounds of cocaine.
- Coast Guard Cutter Legare’s (WMEC 912) crew was responsible for four interdictions, seizing approximately 4,714 pounds of cocaine and 1,826 pounds of marijuana.
- Coast Guard Cutter Spencer’s (WMEC 905) crew was responsible for one interdiction seizing approximately 635 pounds of cocaine and 2,250 pounds of marijuana.
- Jointly, Her Majesty’s Canadian Ship Yellowknife (MM 706) and Kimball’s crews were responsible for one interdiction, seizing approximately 331 pounds of cocaine.
- Jointly, the crews of the Kimball and Legare were responsible for one interdiction, seizing approximately 3,326 pounds of cocaine.

“This marks the first of likely many counter-drug patrols for Kimball and I am extremely proud of our crew’s preparation and hard work to make this an extremely successful deployment. Kimball’s crew demonstrated that through teamwork we were able to remove over $100 million dollars of cocaine, preventing it from ever crossing our borders or entering our neighborhoods, and further removing a source of illicit revenue from transnational criminal networks,” said Capt. Thomas D’Arcy, commanding officer of the Kimball.

The Kimball is a 420-foot Legend-Class national security cutter and is homeported in Honolulu, Hawaii.

Students Help Coast Guard to Find Unmanned Smuggling Boats

A student-built unmanned autonomous surface vessel is brought aboard a Coast Guard patrol craft to conduct detectability testing near Galveston, Texas. *U.S. COAST GUARD / Petty Officer 3rd Class Alejandro Rivera*

GALVESTON, Texas – A unique student project is helping the Coast Guard find small and hard to detect unmanned autonomous surface vessels that might be used to transport drugs into the U.S.

Several USVs have been recovered attempting to transit drugs across the maritime border with Mexico and into California. The boats can carry about 90 pounds of cargo, which could be illegal narcotics or other hazardous cargo.

To learn how these boats might be detected by sensors, the Coast Guard engaged the National Security Innovation Network, a Department of Defense office which collaborates with major universities and the venture community to develop solutions that drive national security innovation. With Coast Guard Sector San Diego as the project sponsor, NSIN capstone students at San Diego State University and Rice University in

Houston, Texas, have been prototyping boats this semester.

Four USVs have been seized by federal law enforcement authorities in Southern California. The first was found in March 2018, another in December 2020, and two more in February and March of 2021, suggesting a high likelihood there are many more that have gone undetected.

The vessels are three to four feet long and have a freeboard of just seven inches. They navigate autonomously and can travel for about 66 nautical miles at a speed of about 2.5 knots.

According to information provided by the U.S. Coast Guard, their above-water profile is minimal, which makes it hard for existing maritime domain awareness tools and detection capabilities to see them. Not only are they capable of reaching uninhabited shores with illegal narcotics, they could also penetrate defense layers surrounding coastal and harbor-based high value targets – military bases, power plants, or critical infrastructure – with explosives.

The purpose of the NSIN project is to improve coastal surveillance, detection and interdiction capabilities to threats posed by this evolving threat. The students were tasked with designing and testing a USV with similar characteristics to ones previously detected, and to test and demonstrate detection using an existing surveillance tool.

Students from Rice University built a replica boat that was "reverse engineered" and demonstrated in Galveston, Texas, March 29-30 to see how a special high-resolution and wide-angle camera called the WAV Surveillance System could be used to detect the boat in realistic conditions.

"The Rice student team designed and constructed a model that can be used to test existing systems leading to enhanced capabilities and also providing a roadmap for others to replicate similar platforms to routinely test their own

system," said Fritz Kuebler, Rice University's Office of Research NSIN program director.

"This project has been underway for about two months and has involved extensive research, design and testing by the student team with regular interaction from the project sponsor," Kuebler said.

"Coast GuardSector Houston-Galveston has been an ardent supporter of this project and provided assets to assist with the testing including deploying and recovering the [unmanned vessel] on the testing days, and coordinated participation with local maritime security stakeholders," said Kuebler.

WAV is a long-range video surveillance solution for homeland security applications and other situations that require persistent visual-domain awareness of very wide areas. It was designed by and developed by Innovative Signal Analysis Inc., of Richardson, Texas, and has both commercial and military applications. WAV is uniquely able to function as both a wide-angle and zoom camera at the same time, and is currently deployed in San Diego Harbor.

"The WAV surveillance system is capable of finding these low probability of intercept targets, because it can survey a wide area, 90-degrees, at a high resolution at a higher refresh rate than a standard point-to-zoom camera," said Jonathan Ray of Innovative Signal Analysis of Richardson, Texas, the company that makes WAV. "We take advantage of these components in our algorithms to build a history of detects of the object to improve location accuracy and object detection confidence."

WAV's imagery led to the eventual discovery of the autonomous USVs.

"This project highlights the value of bright, dedicated STEM students working with national security experts to make a real difference," Kuebler. "It also serves as a proof of concept and example for how creative thinking and new methodologies

advances broader U.S. strategic objectives regarding maritime security and the value of this critical infrastructure.”